Miami Dade College

Course Description

MCB3023L | Principles of Microbiology Lab | 2.00 credits

This Laboratory course accompanies MCB3023. Students will learn and have direct experience with fundamental techniques for observation, isolation, cultivation, enumeration, biochemistry, identification, genetics, and control of microbes. Prerequisites: BSC2010, 2010L, 2011, 2011L, CHM 2211, 2211L. Corequisites: MCB3023.

Course Competencies:

Competency 1: The student will demonstrate proficiency in microscopy and different staining techniques by:

1. Demonstrating the proper use and care of the microscope
2. Explaining the principles of microscopy
3. Discussing the types of stains and their uses
4. Demonstrating correct procedures for simple, differential, and special staining techniques
5. Preparing slides for the examination of living microorganisms

Competency 2: The student will demonstrate mastery of techniques for isolating, culturing, and enumerating microorganisms by:

1. Demonstrating aseptic techniques for transferring and handling bacterial cultures
2. Demonstrating techniques for the isolation of pure cultures
3. Performing serial dilution for plating and counting viable cells
4. Demonstrating the use of a colony counter
5. Demonstrating the use of spectrophotometry to measure bacterial growth
6. Assessing different microbial media for their ability to support microbial growth
7. Demonstrating the use of selective, differential, and enrichment media
8. Analyzing data obtained from a growth curve experiment
9. Classifying microorganisms based on their ability to use oxygen for growth
10. Demonstrating the effects of temperature on bacterial growth
11. Demonstrating techniques for cultivation and enumeration of bacteriophages

Competency 3: The student will understand the basic physical and chemical methods of microbial control by:

1. Evaluating the effectiveness of heat and pH as microbial control methods
2. Documenting the effect of ultraviolet irradiation on bacterial growth
3. Evaluating the activity of various disinfectants and antiseptics on microbial growth
4. Evaluating the effects of various antibiotics and chemotherapeutic agents on microbial growth

Competency 4: The student will demonstrate knowledge of various biochemical testing procedures for the identification of bacteria by:

1. Demonstrating the differences in microbial carbohydrate metabolism
2. Conducting biochemical tests to assess the presence of enzymes and metabolic pathways in bacteria
3. Explaining the use of different media to test the metabolic activity of unknown bacteria
4. Demonstrating the use of commercial rapid test tools for the identification of unknown bacteria
5. Analyzing morphological and biochemical data for identifying an unknown bacterial culture

Competency 5: The student will demonstrate the presence of microorganisms in the environment and in their use in industry by:

1. Assessing the presence of microorganisms in various environments
2. Conducting hand scrubbing to control bacterial concentration on the skin surface
3. Enumerating viable bacteria in food and soil samples

Competency 6: The student will demonstrate knowledge of bacterial genetics and the various mechanisms of gene transfer by:

1. Performing a bacterial conjugation, including data analysis.
2. Performing a bacterial transformation using recombinant DNA including data analysis
3. Performing bacterial DNA extractions
4. Evaluating bacterial DNA yields by spectrophotometry and by gel electrophoresis
5. Performing bacterial restriction enzyme analyses
6. Explaining bacterial restriction enzyme analyses
7. Conducting a PCR reaction to amplify selected genes

Learning Outcomes:

- Communicate effectively using listening, speaking, reading, and writing skills
- Use quantitative analytical skills to evaluate and process numerical data
- Solve problems using critical and creative thinking and scientific reasoning
- Formulate strategies to locate, evaluate, and apply information
- Describe how natural systems function and recognize the impact of humans on the environment